FORM PTO-1390 (Modified) (REV 11-2000) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER	
219872US2XPCT	
U.S. APPLICATION NO (IF KNOWN, SEE 37 CFR)	10/049647

INTERNATIONAL APPLICATION NO	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/FR00/02360	23 August 2000	23 August 1999

TITLE OF INVENTION
DEVICE SECURELY MONITORING DATA SWITCHING

APPLICANT(S) FOR DO/EO/US
Patrice TOILON, et al.

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) The submission must include items (5), (6), (9) and (24) indicated below.
4. ☒ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
   a. ☐ is attached hereto (required only if not communicated by the International Bureau).
   b. ☒ has been communicated by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
   a. ☐ is attached hereto.
   b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
   a. ☐ are attached hereto (required only if not communicated by the International Bureau).
   b. ☐ have been communicated by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
10. ☐ An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).
11. ☐ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☐ A copy of the International Search Report (PCT/ISA/210).

Items 13 to 20 below concern document(s) or information included:

13. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☐ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☐ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825
20. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
21. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
22. ☐ Certificate of Mailing by Express Mail
23. ☒ Other items or information:

PCT/IB/304
Request for Consideration of Documents Cited in the International Search Report
PCT/IB/308
Notice of Priority

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
10/049647	PCT/FR00/02360	219872US2XPCT

24. The following fees are submitted:.		CALCULATIONS PTO USE ONLY
BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :		
☐ Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO	**$1040.00**	
☒ International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO	**$890.00**	
☐ International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO	**$740.00**	
☐ International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4)	**$710.00**	
☐ International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4)	**$100.00**	
ENTER APPROPRIATE BASIC FEE AMOUNT =		**$890.00**
Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☒ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).		**$130.00**

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	
Total claims	- 20 =	0	x $18.00	**$0.00**
Independent claims	- 3 =	0	x $84.00	**$0.00**
Multiple Dependent Claims **(check if applicable)**.			☐	**$0.00**

TOTAL OF ABOVE CALCULATIONS =	**$1,020.00**
☐ Applicant claims small entity status. See 37 CFR 1.27). The fees indicated above are reduced by 1/2.	**$0.00**
SUBTOTAL =	**$1,020.00**
Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☒ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)). +	**$130.00**
TOTAL NATIONAL FEE =	**$1,150.00**
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) **(check if applicable).** ☐	**$0.00**
TOTAL FEES ENCLOSED =	**$1,150.00**
Amount to be: refunded	$
charged	$

a. ☒ A check in the amount of **$1,150.00** to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. **15-0030** A duplicate copy of this sheet is enclosed.

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NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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REGISTRATION NUMBER

Feb. 25 2002
DATE

219872US-2X PCT

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF: :

PATRICE TOILLON ET AL. : ATTN: APPLICATION DIVISION

SERIAL NO: 10/049,647 :

FILED: February 25, 2002 :

FOR: DEVICE FOR SECURELY
MONITORING DATA SWITCHING

PRELIMINARY AMENDMENT

ASSISTANT COMMISSIONER FOR PATENTS
WASHINGTON, D.C. 20231

SIR:

Prior to a first examination on the merits, please amend the above-identified application as follows:

IN THE CLAIMS

Please cancel Claims 1-32 without prejudice.

Please add new Claims 33-66 as follows:

33. (New) Monitoring device for a multichannel numeric switch, the switch including a connecting interface for connecting physical connection circuits to a transmission medium, defining at least one of source and destination ports, and a processing unit for carrying out selective switching of multifield data grids between the different ports, comprising:

a probe unit coupled selectively to the connecting interface; and

a monitoring unit configured to analyze contents of at least part of the data grids probed by the probe unit, and configured to generate a warning signal when the part analyzed does not meet a selected condition.

34. (New) Device according to claim 33, wherein the monitoring unit is further configured to analyze contents of at least part of a field of the data grids probed by the probe unit.

35. (New) Device according to claim 34, wherein the monitoring unit is further configured to analyze contents of at least part of a field of each grid probed by the probe unit.

36. (New) Device according to claim 33, wherein the probe unit is configured to probe grids including at least one of a logic channel field, one physical channel field, and a data field.

37. (New) Device according to claim 33, wherein the probe unit is configured to probe grids including at least one of a grid start field, a destination port address field, a source port address field, and a data field.

38. (New) Device according to claim 33, wherein the probe unit is configured to probe grids including at least one of a virtual path identifier field, a virtual channel identifier field, a payload type field, and a data field.

39. (New) Device according to claim 36, wherein the monitoring unit comprises a table of correspondence specifying for each port connected to the connection circuits a list of authorized grids comprising at least the ports with which the respective port can exchange the grids, and wherein the monitoring unit is further configured to compare contents of this table of correspondence to that of at least one of the fields of the grid being transferred, to generate

the warning signal when its field or fields analyzed designate a port that does not have a correspondence with the source port transmitting the grid, this correspondence forming a chosen condition.

40. (New) Device according to claim 37, wherein the monitoring unit comprises a table of correspondence specifying for each port connected to the connection circuits a list of authorized grids comprising at least the ports with which the respective port can exchange the grids, and wherein the monitoring unit is further configured to compare contents of this table of correspondence to that of at least one of the fields of the grid being transferred, to generate the warning signal when its field or fields analyzed designate a port that does not have a correspondence with the source port transmitting the grid, this correspondence forming a chosen condition.

41. (New) Device according to claim 38, wherein the monitoring unit comprises a table of correspondence specifying for each port connected to the connection circuits a list of authorized grids comprising at least the ports with which the respective port can exchange the grids, and wherein the monitoring unit is further configured to compare contents of this table of correspondence to that of at least one of the fields of the grid being transferred, to generate the warning signal when its field or fields analyzed designate a port that does not have a correspondence with the source port transmitting the grid, this correspondence forming a chosen condition.

42. (New) Switch according to claim 39, wherein the analyzed field or fields is or are chosen from at least the logic channel field and the physical channel field.

43. (New) Switch according to claim 40, wherein the analyzed field or fields is or are chosen from at least the destination port address field of the grid and the source port address field of the grid.

44. (New) Switch according to claim 41, wherein the analyzed field or fields is or are chosen from at least the virtual path identifier field and the virtual channel identifier field.

45. (New) Switch according to claim 39, wherein the table of correspondence includes for each source or destination port at least one list of associated destination addresses, a list of associated source addresses, a list of grid flux types authorized on the port, accompanied by temporal features of each of the fluxes, and a list of the grid lengths authorized to circulate on the port.

46. (New) Switch according to claim 45, wherein the table of correspondence is stored in a modifiable memory selected from at least a live memory, a flash memory, and an assembly of registers each associated with a port and having an individually configurable content.

47. (New) Device according to claim 44, wherein the memory is configured to permit access by writing and/or reading for monitoring.

48. (New) Device according to claim 42, wherein the monitoring unit is configured to effect its comparison on the logic channel field, then on the physical channel field.

49. (New) Device according to claim 43, wherein the monitoring unit is configured to effect its comparison on the destination address field, then on the source address field.

50. (New) Device according to claim 44, wherein the monitoring unit is configured to effect its comparison on the virtual path identifier field, then on the virtual channel identifier field.

51. (New) Device according to claim 39, wherein the monitoring unit is further configured to determine whether contents of the data field of the grid probed by the probe unit has a predetermined format, and to generate the warning signal when at least part of the data field does not verify the format, this verification of format forming the chosen condition.

52. (New) Device according to claim 39, wherein the monitoring unit is further configured to determine a type of grid probed by the probe unit by analyzing contents of its type field, to generate the warning signal when the type field does not correspond to the predetermined type associate with the port having transmitted the grid, this verification of type forming the chosen condition.

53. (New) Device according to claim 39, wherein the monitoring unit is further configured to measure outputs of grids probed by the probe unit, according to their type, and to generate the warning signal when the measured output associated with its type does not correspond to a predetermined output, this verification of output forming the chosen condition.

54. (New) Device according to claim 39, wherein the monitoring unit is further configured to measure for each source port a temporal distance between grids of a same type which it has transmitted, and to generate the warning signal when the temporal distance measured associated with its type does not correspond to a predetermined distance, this verification of distance forming the chosen condition.

55. (New) Device according to claim 39, wherein the monitoring unit is further configured to measure for each destination port a temporal distance between grids of a same type that it has received, and to generate the warning signal when the distance measured

associated with its type does not correspond to a predetermined temporal distance, this verification of distance forming the chosen condition.

56. (New) Device according to claim 36, wherein the monitoring unit is further configured to measure a length of each grid probed by the probe unit, and to generate the warning signal when its measured length does not correspond to a predetermined length associated with its type, this verification of length forming the chosen condition.

57. (New) Device according to claim 36, wherein the monitoring unit is configured to make compatible at each port a number of grids that it transmits and a number of grids that it receives, so as to estimate for each port a rate of use, and to trigger invalidation of a connection between a port and the connection circuits to which it is connected when its estimated rate of use does not correspond to a predetermined rate associated with the type of grid of this port.

58. (New) Device according to claim 33, wherein the monitoring unit is configured to make compatible each generation of a warning signal associated with each port and to trigger invalidation of the connection between a port and to trigger invalidation of the connection between a port and the connection circuits when a number of warning signals generated made compatible for this port is higher than a threshold.

59. (New) Device according to claim 33, wherein the monitoring unit is configured to make compatible each warning signal generated associated with each port and to trigger rejection by the processing unit of the grid seen by the probe unit, when a number of warning signals generated made compatible for a port is higher than a threshold.

60. (New) Device according to claim 33, wherein the monitoring unit is configured to make compatible each warning signal generated associated with each port and to trigger

rejection by the processing unit of the grid probed by the probe unit, when a number of warning signals generated made compatible for a port is higher than a threshold.

61. (New) Device according to claim 33, wherein the monitoring unit is configured, upon the transmission of a warning signal, to trigger rejection of the grid probed by the probe unit.

62. (New) Device according to claim 33, wherein the monitoring unit is configured, upon transmission of a warning signal, to trigger the processing unit to reject the grid probed by the probe unit.

63. (New) Device according to claim 61, wherein the monitoring unit is configured to make compatible each rejection associated with each port and to trigger invalidation of the connection between a selected port and the connecting circuits when a number of rejections made compatible for the selected port is higher than a threshold.

64. (New) Switch, comprising a device according to claim 33.

65. (New) Communication installation, comprising at least one switch equipped with at least one device according to claim 33, the ports of the switch being connected to machines and computers.

66. (New) Installation according to claim 65, wherein it is implanted in an airship comprising a flight management computer and a flight control computer.

IN THE ABSTRACT

Please add the following new Abstract on a separate sheet:

ABSTRACT

A multichannel digital switching unit including a connection interface between circuits that provides the physical links to a transmitting environment defining the ports and a processing unit that switches multi-field data frames between the different ports. A frame monitoring device include a probe module that is selectively linked to the connection interface and a surveillance module that analyzes contents of at least a part of each data frame processed by the probe and generates a warning signal when the part that is analyzed fails to fulfil a chosen criterion.

REMARKS

Favorable consideration of this application, as presently amended, is respectfully requested.

The present preliminary amended is submitted to place the above-identified application in more proper format under United States practice.

By the present preliminary amendment original Claims 1-32 are canceled and new Claims 33-66 are presented for examination. New Claims 33-66 are deemed to be self-evident from the original disclosure, including original Claims 1-32, and thus are not deemed to raise any issues of new matter. Further, new Claims 33-66 are not believed to be more narrow in scope in any aspect in comparison with original Claims 1-32.

An Abstract is also submitted herein.

The present application is believed to be in condition for a full and thorough examination on the merits. An early and favorable consideration of the present application is

hereby respectfully requested.

Respectfully submitted,

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219872US-2X PCT

Marked-Up Copy
Serial No: _____
Amendment Filed on:
_____

IN THE CLAIMS

--Claims 1-32 (Canceled).

Claims 33-66 (New).

IN THE ABSTRACT OF THE DISCLOSURE

(New).--

Device for securely monitoring data switching

The invention relates to the field of switching data grids (or cells), and in particular monitoring devices for a multichannel numeric switch.

The word "grid" is to be taken in its widest sense here, in that it designates all types of messages formed of a multiplicity of fields sequenced according to predetermined formats. In the same way, the word "data" is to be taken in its widest sense, in that it designates all data contained in a message, including the data relating to the message transmitter (or source), the destination(s) of this message, or even the type of message.

Such switches conventionally comprise physical connection circuits, generally referred to as the "physical layer", connected to a transmission medium which defines the source (or input) communication ports and/or destination (or output) communication ports, to which articles of IT hardware (or machines) are connected. They also comprise a processing unit, generally referred to as the "logic layer", and a connecting interface between the processing unit and the connecting circuits, for each of the ports, selectively. The processing unit ensures numeric switching of multifield data grids between the different ports, i.e. between a source port and at least one destination port.

These switches therefore form part of a communication installation in which independent physical links permit separation of the data in a manner known as "segmented" and not "diffused".

In order to ensure good functioning of such an installation the data received by one (or more) destination machine(s) (which will be likened hereinafter to the destination or output communication port to which it is "attached") must be substantially identical

to those transmitted by the source machine (which will be likened hereinafter to the source or input communication port to which it is "attached").

Due to the complexity of the various connections, the very nature of the transmission media, and the conditions in which the grid exchanges take place, it frequently happens that certain grids deteriorate during their transfer from the source machine to the destination machine. This is particularly so with "COTS"-type switches, which are very widely used in information technology and telecommunications, due in particular to their low cost and the virtually universal format of the grids.

This disadvantage makes switches of the above-mentioned type difficult to use, indeed even unusable, in certain fields of application where the protection of the data is of great importance. This is the case in avionics where the management and control of flight is concerned.

Moreover, it is important that breakdowns and/or loss of functioning are treated.

The object of the present invention is therefore to procure a monitoring device for a multichannel numeric switch intended to improve the situation mentioned above, particularly where security is concerned.

It proposes to this end a device of the type described in the introduction, wherein a probe unit coupled selectively to the connecting interface is provided, together with a monitoring unit capable of analysing the content of at least part of every grid (or cell) of data seen by the probe unit, and to generate a warning signal when the analysed part does not meet a selected condition.

It is thus possible to access, in a non-intrusive and selective manner, and on each of the ports being monitored (not necessarily all), every part of each grid in the process of switching in the switch, so as to monitor the coherence of the content of that grid.

In a currently preferred embodiment, the monitoring unit is so conceived as to trigger the processing unit, by means of the warning signal, to reject the grid seen by the probe unit. In this manner, every grid having an incoherence, of whatever type, is rejected: in other words, it is not presented to the output of the switch.

In a modification of this embodiment, the monitoring unit is so conceived as to trigger itself, with the warning signal, rejection of the grid seen by the probe unit. This saves time.

In another modification, the monitoring unit is so conceived as to make compatible the warning signals associated with each port, and to trigger rejection, either by itself, or by the processing unit, of the grid seen by the probe unit, when the number of warning signals made compatible for one port is higher than a certain threshold.

Conversely, the monitoring unit can be so adapted as to make compatible each rejection associated with each port being monitored and to trigger invalidation of the connection between a port and the connection circuits when the number of rejections made compatible for this port is higher than a certain threshold. Obviously, such invalidation is preferably temporary, so that once the problem has been resolved at the faulty port, this can be used again for transmission and/or reception (or validated).

The invention applies particularly, but not in a limiting way, to switches equipped with interfaces adapted to the standard formats of multifield grids selected from ETHERNET, ATM and HIGH-SPEED LINK.

Furthermore, the invention also relates to switches equipped with a monitoring device of the type described above, as well as communication installations which comprise one or more switch(es) equipped with such a device. It applies particularly to communication installations used in avionics for managing and controlling flight.

Further features and advantages of the invention will appear from the detailed description below and from the attached drawings, in which:

Figure 1 shows diagrammatically and in a simplified form a switch equipped with a monitoring device according to the invention;

Figure 2 details diagrammatically a monitoring device according to the invention;

Figure 3 is a diagram illustrating a grid with the ETHERNET format;

Figure 4 is a block circuit diagram illustrating a processing mode of a grid having ETHERNET format; and

Figure 5 illustrates diagrammatically an installation having two switches equipped with a monitoring device according to the invention.

The attached drawings comprise elements of a certain character which it is difficult to define fully by the text. Consequently, they may contribute to the definition of the invention.

The invention relates to a device for monitoring messages or grids, or even cells, in the process of switching in a multichannel numeric switch.

Such a switch is intended to receive messages transmitted by machines (or more generally information technology hardware) according to a predetermined format with a view to switching them towards one or more other machines. The machine that transmits a message is called the source machine, whereas the machine that is the destination of a message is called the destination machine. Obviously, one and the same machine can be source and/or destination by turns or simultaneously.

As is illustrated in Figures 1 and 2, each machine E-i (here i = 1 to 4) is connected to the switch by the bias of a transmission medium 1, which may be a cable or optic fibre, or even the ether when the messages are transmitted via waves. This transmission medium may be mono- or bi-directional.

The end of the transmission medium 1, which is opposed to the machine E-i, is connected to physical connecting circuits 2, which form a physical interface or physical layer. The place where the connection is made between the physical layer 2 and the various transmission media is conventionally called port 3. In the switch, each port 3 is associated with a port identification which may be used either as a source (or input) port local address, or as a destination (or output) port local address, according to whether the machine to which this port is connected transmits the message (or data grid) or is the destination thereof.

On the physical layer 2 (or physical connection circuits), the ports 3 are installed in series (see Figure 1).

In a conventional switch (i.e. from the prior art), the switching of a grid arriving at a port 3 of the physical layer 2 is effected by a processing unit 4, which is called the logic layer, or again a switching logic interface.

The logic layer 4 is connected to the physical layer 2 via a connecting interface 5.

In fact, as is illustrated in Figure 2, in the ETHERNET or ATM-type switches, the physical layer 2 comprises a large number of transmitters/receivers 7-i comprising an analogue input 8-i, an analogue output 9-i, a numeric output 10-i and a numeric input 11-i. In the example shown in Figure 2, the switch being of the "4x4" type, the variable i assumes values of between 1 and 4.

Furthermore, in these switches, the processing unit 4 (or logic layer) is composed of a large number of switching elements 12-i associated respectively with a transmitter/receiver 7-i. The connecting interface 5 can therefore be subdivided into bi-directional (5-i) parts, each permitting connection of the numeric output 10-i of a transmitter/receiver 7-i to the numeric input 13-i of a switching element 12-i, and of the numeric output 14-i of the switching element 12-i to the numeric input 11-i of the transmitter/receiver 7-i.

The various switching elements 12-i of the logic layer 4 are interconnected so that upon reception of a grid at the numeric input 13-i of one of them, this grid can be transmitted to one (or more) of these switching elements 12-j, associated with the transmitter/receiver(s) 7-j which supplies/supply the port(s) 3-j designated via the destination field address contained in the grid to be switched.

The physical connection circuits 2 are called the physical layer 2 because they receive analogue data from the ports 3-i and transmit numeric data to the processing unit 4, via the connecting interface. The processing unit 4 is called the logic layer because it receives, processes and transmits numeric data.

The grids which are exchanged in such a switch have a particular format known as 'multifield', of the type illustrated in Figure 3 (ETHERNET format).

Such a multifield grid comprises, at least, a grid start field, a destination address field, a source address field and a data field. In a communication installation, these different fields are always sequenced in the same manner.

A certain number of standard formats use multifield grids of the type described above, with or without complementary field(s). One might cite for example standard formats of the ETHERNET, ATM and HIGH-SPEED LINK (HS LINK) types.

Many manufacturers market switches capable of operating according to the above-mentioned formats. One can cite for example ETHERNET switches by the firms CISCO, 3COM, INTEL, IBM, HEWLETT PACKARD, D-LINK etc. As these switches are very widespread in the market, there is no need to describe them here. Those that belong to the category known as "COTS" (for "Commercial of the Shelves", i.e. "component widely used commercially") have the advantage of processing grids whose format is universally used, unlike other specific formats, such as that of the ARINC standard (429 or 629).

By way of example, one might use an ETHERNET connecting interface of the type "medium independent interface" (MII) or its improvements such as, for example, RMII (Reduce MII), or a UTOPIA-type ATM connecting interface.

Whatever the format of the communication installation, a grid arrives by a source port 3-i, is transferred to the transmitter/receiver 7-i of the physical layer 2, borrows the part 5-i of the connecting interface 5 which is connected to the transmitter/receiver 7-i in order to reach the switching element 12-i of the logic layer 4. There its destination address field is analysed so as to determine the corresponding destination port 3-j. The grid is therefore communicated to the switching element 12-j, then to the transmitter/receiver 7-j via the part 5-j of the connecting interface, in order to be transmitted by the port 3-j.

As was indicated in the introduction, it frequently occurs that switching grids deteriorate before arriving at the switch, or even that the switch causes the grids received to deteriorate during switching.

The object of the invention is to improve the situation, and to this end the invention proposes a device for monitoring the coherence of data grids which are switched in a multichannel numeric switch between a source port and one or more destination ports.

Such a device first comprises a probe unit 6 capable of observing during broadcast on the connecting interface 5 the data grids which are in transit between the physical layer 2 and the logic layer 4. Hereinafter, a transmission from the physical layer 2 towards the logic layer 4 will be referred to as 'rising', and transmission from the logic layer 4 towards the physical layer 2 as 'falling'.

The Applicant has found in fact that it was particularly advantageous to observe the rising and/or falling grids on the various parts 5-i of the connecting interface. This is because the data circulating on this interface 5 are numeric and totally representative, being identical thereto, of the data of the grids to be switched.

The probe unit 6 according to the invention observes each part 5-i of the connecting interface which connects a switching element 12-i to a transmitter/receiver 7-i. In the example shown, this observation is effected on each rising part 5-iM and on each falling part 5-iD. Obviously, one could carry out observations only on one or more rising parts, or only on one or more falling parts, or even on certain rising parts and certain falling parts.

It is therefore possible to observe the grids selectively.

In the example in Figure 2, each rising part 5-iM of the connecting interface is observed independently of the other rising parts by a probe sub-unit 6-iM, and each falling part 5-iD of the connecting interface is observed independently of the other falling parts by a probe sub-unit 6-iD. This ensures the independence of the observations carried out on the rising part from those carried out on the falling part. Each probe sub-unit can be realised as a connection.

Each probe sub-unit 6-iM supplies a rising monitoring sub-unit 15-iM, and each probe sub-unit 6-iD feeds a falling monitoring sub-unit 15-iD.

These different monitoring sub-units 15-i together form a monitoring unit 15. However, it is preferable, but not indispensable that the probe sub-units 15-iM and 15-iD physically form one and the same sub-unit 15-i in the sense that they manage one and the same port 3-i.

Each rising 15-iM and falling monitoring sub-unit 15-iD is conceived to analyse at least part of a field of the grid being observed which circulates on the part of the connecting interface 5 concerned. Consequently, each monitoring sub-unit 15-i, rising or falling, is capable of recognising from the fields transmitted thereto by the associated probe sub-unit 6-i the field or fields which it must analyse. Preferably, each monitoring sub-unit 15-i is configured (or programmed) so as to analyse successively, i.e. as they are transferred from a transmitter/receiver 7-i to an associated switching element 12-i, or reciprocally, plural fields of one and the same grid, and in particular the destination address field, the source field address and the grid type field.

The various monitoring sub-units 15-i, whether rising or falling, can have different configurations according to the type of machine whose switching they monitor in a selective manner. Thus, local monitoring units are formed which are adapted to the needs of each port 3-i.

Management of the configuration of each sub-unit 15-i is carried out, preferably, by a part of the device according to the invention coupled to the monitoring unit 15. This part, which is known as the monitoring unit 16, receives and transmits numeric "data" to the different monitoring sub-units 15-i via a (rising) connection 17M or a (falling) connection 17D.

As will be seen below, the monitoring unit 16 carries out preferably other tasks than the management of the sub-modules' configuration.

In order to describe the monitoring mechanism carried out by a monitoring device according to the invention, Figure 3 and 4 will now be referred to.

Figure 3 shows a grid with the ETHERNET format. As indicated above, it comprises a grid start field, then a destination address field (also known as MAC destination address), then a source address field (also known as MAC source address), then a grid type field. It then comprises a data field and a CRC field (English acronym standing for Cyclic Redundancy Check).

The fields of a multifield grid are transmitted one by one in the order indicated above when the grid is transferred from the physical layer 2 to the logic layer 4, and vice versa. It is therefore possible to analyse the content of at least part of one or more fields which follow one another in order to verify the coherence of the grid (or cell).

Obviously the grids which have formats other than ETHERNET will not have exactly the same configuration as that shown in Figure 3. For example, in the ATM format, after the grid start, the first field is a field known as "Virtual Path Identifier", the second field is a field known as "Virtual Channel Identifier", and the third field is a field known as "Payload Type". Thereafter is a field of priority and monitoring, and a data field.

In a more general manner, a grid may comprise at least one or more so-called physical fields which designate one or more physical "channels", such as a source port or a destination port, one or more fields known as logic fields, which designate one or more logic "channels" such as a flux, and a data field.

As is illustrated in Figure 4, in the case of a grid of ETHERNET format being transferred from the transmitter/receiver 7-l to the associated switching element 12-l, the rising part 6-lM of the probe unit, which is connected to the rising part 5-lM of the connecting interface, transmits as soon as it observes the same the grid start field to

the monitoring sub-unit 15-lM. This sub-unit is thus warned that it will have to analyse a rising data grid. This forms the stage 100, which will be discussed below in the context of a dynamic analysis of the grids.

As soon as the second destination address field is observed (and therefore reconstituted) by the rising part 6-lM of the probe unit, it is transmitted to the monitoring sub-unit 15-lM in order to be analysed in a stage 110.

This analysis is intended to check whether the address of the destination of the grid corresponds to one of the ports 3-i. managed by the switch. To this end, the monitoring unit 15 comprises a memory 18 in which is found stored a table of correspondence between each port 3-i of the switch and the destination addresses authorised for this port. By a juxtaposition between the data contained in the field and those contained in the table of correspondence, one can check instantly the grid-port coherence, i.e. give or refuse authority to communicate with the port designated by the destination address.

The table of correspondence can be shared by all the monitoring sub-units 15-i, but may also, as is illustrated in Figure 2, be subdivided into plural (i) parts associated respectively with the different ports. In this case, each monitoring sub-unit 15-i. comprises a modifiable memory 18-i, such as a live memory, a bank of registers each associated with a port and having an individually configurable content, or, even better, a flash-type memory, which contains the list of grids (messages, cells) authorised for each port 3-j. The expression 'list of grids' must be taken in a wide sense. It includes for each port all the ports with which it can exchange grids, the different types of grids authorised, the lengths of grid according to the type of flux, etc..

Preferably, the modifiable memory 18 can be accessed for reading and/or writing so as to permit monitoring of its content.

If the address is incoherent, the monitoring sub-unit 15-lM transmits, in this embodiment, to the monitoring unit 16, via the connection 17M, a warning signal indicating an incoherence in the address of the destination port.

Two embodiments can be considered possible at this stage. In a first embodiment, upon receipt of the warning signal, the monitoring unit 16 will address to the switching element 12-l a signal ordering it not to transfer the grid being transferred. This therefore brings about rejection of the grid.

In a second embodiment, each monitoring sub-unit 15-iM acts directly on the switching element 12-i associated therewith, without the need to pass through the monitoring unit 16. To this end it comprises an output 19M which is connected to the switching element 12-i in order to send thereto the warning signal intended to trigger rejection of the grid being transferred. However, the monitoring unit 16 is preferably warned by each monitoring sub-unit 15-i. or by each switching element 12-i., of each rejection associated with each port, so as to make compatible for each port, whether source or destination, the number of grid rejections of which it is the object.

The rejections (or warning signals) may be made compatible for both above-mentioned embodiments. The monitoring unit 16 may thus, when the number of rejections associated with a port 3-i exceeds a selected threshold, e.g. six, decide to invalidate this port 3-i. To this end, the monitoring unit 16 is connected by a connection 20 to the physical layer 2, and preferably to each of its transmitters/receivers 7-i.

Obviously, different invalidation thresholds can be considered for different ports, according to need, and in particular according to the degree of security required at each port.

It is conceivable that the monitoring unit 16 have the option of forcing the switching of a grid, even when a monitoring sub-unit 15-i. has triggered rejection of the grid in the associated switching element 12-i.

For processing descending grids, there is provided, instead of the connection 17M, a connection 17D between each monitoring sub-unit 15iD and the monitoring unit 16, in order to transmit the warning signal intended to trigger rejection of a descending grid being transferred. Obviously, as indicated above, each monitoring sub-unit 15-iD could act directly on the transmitter/receiver 7-i. associated therewith, without the need to pass through the monitoring unit 16. It comprises in this case an output 19D connected to the transmitter/receiver 7-i. in order to send thereto the warning signal intended to trigger rejection of the grid being transferred. Nevertheless, when a monitoring unit 16 is provided, it is warned preferably by each monitoring sub-unit 15-i. (e.g. via the connection 17) or by each transmitter/receiver 7-i. (e.g. by the connection 20 which is in this case bi-directional), of each rejection associated with each port, so as to make compatible for each port, whether source or destination, the number of grid rejections of which it is the object.

In a modification, a mode of grid rejection is conceivable which operates by making warning signals compatible. In this case, the monitoring unit 16 makes compatible for each port 3-i the warning signals (or incoherence signals) which are supplied by the monitoring sub-units 15-iM and 15-iD, so that only an incoherent grid arriving after N preceding incoherent grids is rejected. N designates here a threshold number which may be each, for example, to four or five. Obviously, each monitoring sub-unit 15-i. could carry out this operation of making warning signals compatible for its port 3-i instead of the monitoring unit 16.

If the result of the analysis carried out in stage 110 does not indicate any incoherence, one moves on to the stage 120 in which the monitoring sub-unit 15-lM proceeds to analysis of the address field of the source port which has just been observed (and

therefore reconstituted) by the probe unit 6M on the rising part 5M of the connecting interface.

As for the preceding field, a comparison is to be carried out between the source port address contained in the grid being transferred and the addresses of ports which are contained in the table of correspondence 18 (or 18-l).

As above, if an incoherence is detected, a warning signal is transmitted by the monitoring sub-unit 15-lM in the direction of the monitoring unit 16 and/or the switching element 12-l (by the connection 19M), according to the embodiment concerned. This will have the effect either of triggering rejection of the grid being transferred, or of incrementing by one unit of value the variable of matching of the warning signals (in the case of a statistical analysis).

If incoherence is not detected, one moves on to a stage 130, in which the monitoring sub-unit 15-lM proceeds to analysis of the grid type field, which is supplied by the probe unit 6M after its observation on the rising part 5M of the connecting interface.

This grid type analysis consists in checking whether the type contained in the field observed is part of a list of types which is memorised, e.g. in the memory 18 (or 18-i). Obviously, in a modification, instead of a list of types of grid, one may only provide a single type associated with each port.

When the type of grids does not correspond to that or those stored, a warning signal may be transmitted by the monitoring sub-unit 15-lM with a view either to immediate rejection or possible rejection (in the statistical case).

If there is no incoherence, the monitoring sub-unit 15-lM will proceed to an analysis which one might call 'dynamic' as opposed to analyses carried out at stages 100 to 130, which are rather of the 'static' type.

A data grid is not generally isolated inside a communication installation. It belongs to a flux of data which may be specific or non-specific. By way of example, in the field of avionics, there are at least three different levels of flux associated respectively with very high-level priority data, such as periodic (critical) data, high-level priority data, such as urgent aperiodic data, and low-level priority data, such as urgent non-periodic data.

One may thus authorise one or more different fluxes associated with different types of grid by means of the monitoring unit 16 in each monitoring sub-unit 15-iM and 15-iD.

In a stage 140, one or more measurements are carried out which bear on the flux associated with the type of grid detected at stage 130. It may be, for example, a measurement of the rate of global use per unit time, or per pre-determined cycle, of the port being considered (here the port 3-l). It might be a measurement for each type of flux identified of the length of the grid per flux. It might also be a measurement of the temporal distance between grids.

Some of these dynamic analyses of grids, in particular the two last ones, use the grid start field for their measurements, which is determined in stage 100.

The measurement of temporal distance separating two consecutive grid starts might rest on the acquisition, upon each reception of a grid start, of the current time managed by each monitoring sub-unit 15-iM and 15-iD and the comparison with the expected time for a grid of the same type.

The analysis carried out in the stage 140 therefore consists, in the rising direction, of monitoring the capacity of the source machine (or possibly of another upstream switch) to generate grids which are compatible (or coherent), in terms of the quantity of data and the quality of flux, with the port to which it is connected. In the falling

direction, the analysis consists of monitoring the capacity of the processing unit 4 (or logic layer) to return correctly fluxes of data to one or more destination ports.

In general, the entirety of analyses carried out in the rising direction, on each port, consists in admission monitoring, whereas the entirety of analyses carried out in the falling direction, still on each port, consists of return monitoring.

Although the fields are transmitted as they are observed, i.e. during their transfer from one layer to another, it is possible to conceive a parallel field analysis, in particular when one of the analyses requires a longer analysis time than that necessary to analysis of the next field.

Furthermore, one might also conceive of only analysing part of a field, and not the whole field. This might be the case in particular when analysing the data field. One can conceive of placing in this data field a specific datum which, when it has a value which is different from one or more predetermined values, or even if it is not present at all, triggers a warning signal.

Nevertheless, analysis of part of the data field has some risks in that the analysis must be finished before the grid being transferred has been completely transmitted either to the logic layer, in the case of a rising grid, or to the physical layer, in the case of a falling grid.

In the above, multiple analysis was described. But obviously, it is possible to carry out single analysis, which is either static, i.e. relating to the address field of the destination port or the address field of the source field, or the grid type field, that is a purely dynamic analysis, i.e. relating to the flux associated with the type of grid.

In summary, the monitoring mechanism implemented by the monitoring device according to the invention comprises four successive stages, a first stage of

observation, a second stage of detection, a third stage of action, and a fourth stage of fault containment.

As is shown in Figure 5, the data grids arriving at the ports of a first switch do not necessarily originate from a machine such as a computer or sensor. In fact, they may come from any type of IT hardware operating according to the format of the switch equipped with the device according to the invention, in particular with the destination port of another switch. In the same way, the destination port of a first switch may be connected by a transmission means to the source port of a second switch. It is important to note that one of the two switches may not be equipped with a device according to the invention.

The device according to the invention comprises, preferably, a purely hardware part, consisting in particular of the probe unit and the storage memory for data specific to the analyses (such as the list of authorised addresses, the list of master templates or authorised fluxes), and of a purely software part, preferably reprogrammable, for the rest. The monitoring device according to the invention might therefore be manufactured in the form, for example, of an ASIC coupled to a modifiable memory (live or flash), or of an ASIC with a bank of registers; an ASIC capable of ensuring monitoring or one or more ports.

By virtue of the invention, it is possible to effect monitoring/detection in real time, which makes it possible to act on the current grid (principle of "fault containment"). Moreover, the performance of the switch is not impaired, since the monitoring/detection is carried out in parallel. Finally, this invention makes it possible to obtain very low non-detected error rates, as there is total dissociation of the implementation of the principle (monitoring mechanism) relative to the object being monitored, i.e. between the transfer and the switching of data; in other words, there is no link between monitoring and transfer.

The invention is not limited to the embodiments described above, but covers all modifications which might be developed by the person skilled in the art in the context of the claims below.

Thus embodiments have been described in which each port of the switch is monitored by the device according to the invention. However, one may conceive that only some of the ports are monitored, e.g. only the input (source) ports or only the output (destination) ports, or any combination of input/output ports.

The invention further covers switches equipped with a device according to the invention, as well as communication installations equipped with one or more switches equipped with a device according to the invention.

Furthermore, the invention has been described with reference to the analysis of grids with ETHERNET format. But the invention relates to other types of grid, such as those of the ATM type, or those comprising more generally physical and/or logic fields or channels. In these embodiments, the unit will therefore be actuated so as to see one or more of their respective fields and the monitoring unit will effect its comparison preferably on the Virtual Path Identifier field, then on the Virtual Channel Identifier field, and on the logic channel field, then on the physical channel field respectively.

Claims

1. Monitoring device for multichannel numeric switch, the switch comprising an interface (5) for connecting physical connection circuits (2, 7) to a transmission medium (1), defining source and/or destination ports (3), and a processing unit (4, 12) for carrying out the selective switching of multifield data grids between these different ports, characterised in that it comprises a probe unit (6) coupled selectively to the connecting interface (5), and a monitoring unit (15) capable of analysing the content of at least part of the data grids seen by the probe unit (6), and of generating a warning signal when the part analysed does not meet a selected condition.

2. Device according to claim 1, characterised in that the monitoring unit (15) is contrived to analyse the content of at least part of a field of each grid seen by the probe unit (6).

3. Device according to claim 2, characterised in that the monitoring unit (15) is contrived to analyse the content of at least part of a field of each grid seen by the probe unit (6).

4. Device according to one of claims 1 to 3, characterised in that the probe unit (6) is contrived to see grids comprising at least one logic channel field, one physical channel field and a data field.

5. Device according to one of claims 1 to 3, characterised in that the probe unit (6) is contrived to see grids comprising at least one grid start field, a destination port address field, a source port address field, and a data field.

6. Device according to one of claims 1 to 3, characterised in that the probe unit (6) is contrived to see grids comprising at least one field known as 'Virtual Path Identifier', a

field known as 'Virtual Channel Identifier', a field known as 'Payload Type', and a data field.

7. Device according to one of claims 4 to 6, characterised in that the monitoring unit (15) comprises a table of correspondence specifying for each port (3) connected to the connecting circuits (2, 7) a list of authorised grids comprising at least the ports (3) with which it can exchange the grids, and in that the monitoring unit (15) is contrived to compare the content of this table of correspondence to that of at least one of the fields of the grid being transferred, in order to generate the warning signal when its field or fields analysed designate a port which does not have a correspondence with the source port transmitting the grid, this correspondence forming the aforementioned chosen condition.

8. Switch according to claim 7 in combination with claim 4, characterised in that the analysed grid field(s) is/are chosen from at least the logic channel field and the physical channel field.

9. Switch according to claim 7 in combination with claim 5, characterised in that the analysed grid field(s) is/are chosen from at least the destination port address field of the grid and the source port address field of this grid.

10. Switch according to claim 7 in combination with claim 6, characterised in that that the analysed grid field(s) is/are chosen from at least the Virtual Path Identifier field and the Virtual Channel Identifier field.

11. Switch according to one of claims 7 to 10, characterised in that the table of correspondence comprises for each source or destination port at least one list of associated destination addresses, a list of associated source addresses, a list of grid flux types authorised on the port, accompanied by the temporal features of each of the fluxes, and a list of the grid lengths authorised to circulate on the port.

12. Switch according to the preceding claim, characterised in that the table of correspondence is stored in a modifiable memory (18) selected from at least a live memory, a 'flash'-type memory, and an assembly of registers each associated with a port and having an individually configurable content.

13. Device according to claim 12, characterised in that the memory is contrived to permit access by writing and/or reading for the purpose of monitoring.

14. Device according to one of claims 7 to 13 in combination with claim 4, characterised in that the monitoring unit (15) is contrived to effect its comparison on the logic channel field, then on the physical channel field.

15. Device according to one of claims 7 to 13 in combination with claim 5, characterised in that the monitoring unit (15) is contrived to effect its comparison on the destination address field, then on the source address field.

16. Device according to one of claims 7 to 13 in combination with claim 6, char the monitoring unit (15) is contrived to effect its comparison on the Virtual Path Identifier field, then on the Virtual Channel Identifier field.

17. Device according to one of claims 4 to 16, characterised in that the monitoring unit (15) is contrived to determine whether the content of the data field of the grid seen by the probe unit (6) has a predetermined format and in order to generate the warning signal when at least part of the data field does not verify the format, this verification of format forming the aforementioned chosen condition.

18. Device according to one of claims 4 to 17, characterised in that the monitoring unit (15) is contrived to determine the type of grid seen by the probe unit (6) by analysing the content of its type field, in order to generate the warning signal when

the type field does not correspond to the predetermined type associate with the port having transmitted the grid, this verification of type forming the aforementioned chosen condition.

19. Device according to one of claims 4 to 18, characterised in that the monitoring unit (15) is contrived to measure the output of grids seen by the probe unit (6), according to their type, and in order to generate the warning signal when the measured output associated with its type does not correspond to a predetermined output, this verification of output forming the aforementioned chosen condition.

20. Device according to one of claims 4 to 19, characterised in that the monitoring unit (15) is contrived to measure for each source port the temporal distance between the grids of the same type which it has transmitted, and in order to generate the warning signal when the distance measured associated with its type does not correspond to a predetermined distance, this verification of distance forming the aforementioned chosen condition.

21. Device according to one of claims 4 to 19, characterised in that the monitoring unit (15) is contrived to measure for each destination port the temporal distance between the grids of the same type that it has received, and in order to generate the warning signal when the distance measured associated with its type does not correspond to a predetermined distance, this verification of distance forming the aforementioned chosen condition.

22. Device according to one of claims 4 to 21, characterised in that the monitoring unit (15) is contrived to measure the length of each grid seen by the probe unit (6), and in order to generate the warning signal when its measured length does not correspond to a predetermined length associated with its type, this verification of length forming the aforementioned chosen condition.

23. Device according to one of claims 4 to 22, characterised in that the monitoring unit (15) is contrived to make compatible at each port the number of grids that it transmits and the number of grids that it receives, so as to estimate for each port a rate of use, and to trigger invalidation of the connection between a port and the connecting circuits (2, 7) to which it is connected when its estimated rate of use does not correspond to a predetermined rate associated with the type of grid of this port.

24. Device according to one of claims 1 to 23, characterised in that the monitoring unit (15) is contrived to make compatible each generation of a warning signal associated with each port and to trigger invalidation of the connection between a port and to trigger invalidation of the connection between a port and the connecting circuits when the number of warning signals generated made compatible for this port is higher than a threshold.

25. Device according to one of claims 1 to 24, characterised in that the monitoring unit (15) is contrived to make compatible each warning signal generated associated with each port and to trigger rejection by the processing unit (4, 12) of the grid seen by the probe unit (6), when the number of warning signals generated made compatible for a port is higher than a threshold.

26. Device according to one of claims 1 to 24, characterised in that the monitoring unit (15) is contrived to make compatible each warning signal generated associated with each port and to trigger rejection by the processing unit (4, 12) of the grid seen by the probe unit (6), when the number of warning signals generated made compatible for a port is higher than a threshold.

27. Device according to one of claims 1 to 24, characterised in that the monitoring unit (15) is contrived, upon the transmission of a warning signal, to trigger rejection of the grid seen by the probe unit (6).

28. Device according to one of claims 1 to 24, characterised in that the monitoring unit (15) is contrived, upon the transmission of a warning signal, to trigger the processing unit to reject the grid seen by the probe unit (6).

29. Device according to one of claims 27 and 28, characterised in that the monitoring unit (15) is contrived to make compatible each rejection associated with each port and to trigger invalidation of the connection between a port and the connecting circuits (2, 7) when the number of rejections made compatible for this port is higher than a threshold.

30. Switch, characterised in that it comprises a device according to one of the preceding claims.

31. Communication installation, characterised in that it comprises at least one switch equipped with at least one device according to one of claims 1 to 29, the ports of the switch being connected to machines and computers.

32. Installation according to claim 31, characterised in that it is implanted in an airship comprising a flight management computer and a flight control computer.

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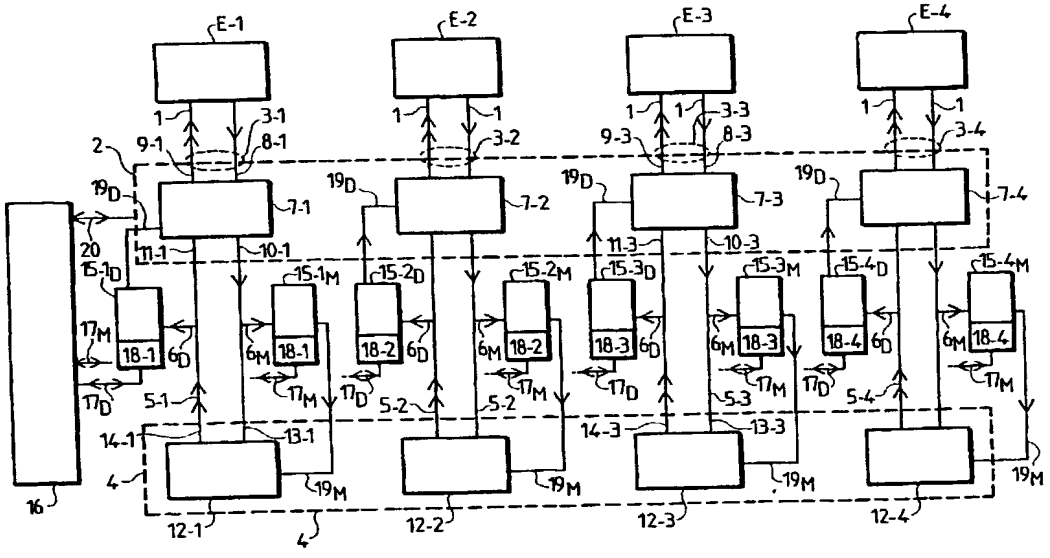
[Suite sur la page suivante]

(54) Title: DEVICE FOR SECURELY MONITORING DATA SWITCHING

(54) Titre: DISPOSITIF DE CONTROLE SECURISE DE COMMUTATION DE DONNEES



(57) Abstract: A multichannel digital switching unit comprises a connection interface (5) between circuits (2, 7) which provide the physical links to a transmitting environment defining the ports (3); and a processing unit (4, 12) which switches multi-field data frames between the different ports. A frame monitoring device comprises a probe module (6) which is selectively linked to the connection interface (5) and a surveillance module (15-18) which has means for analysing the contents of at least a part of each data frame processed by the probe (6) and generating a warning signal when the part that is analysed fails to fulfil a chosen criterion.

[Suite sur la page suivante]

WO 01/15371 A2

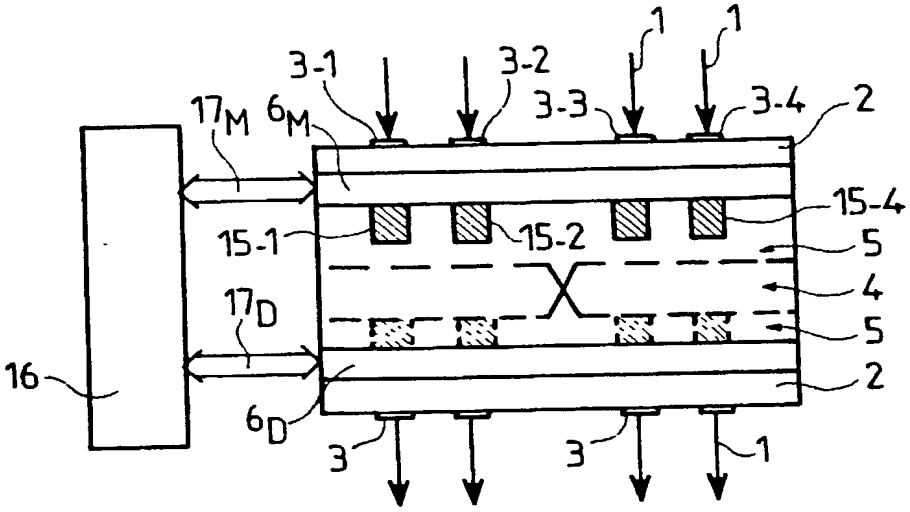


FIG.1

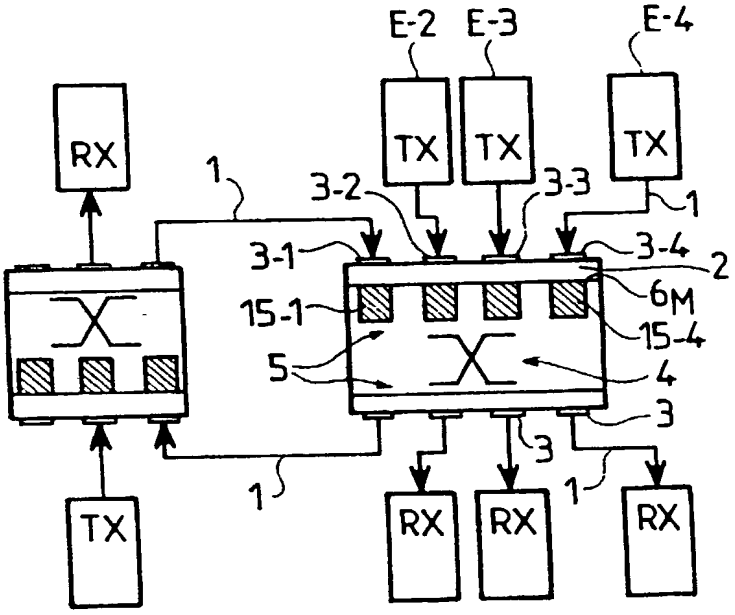
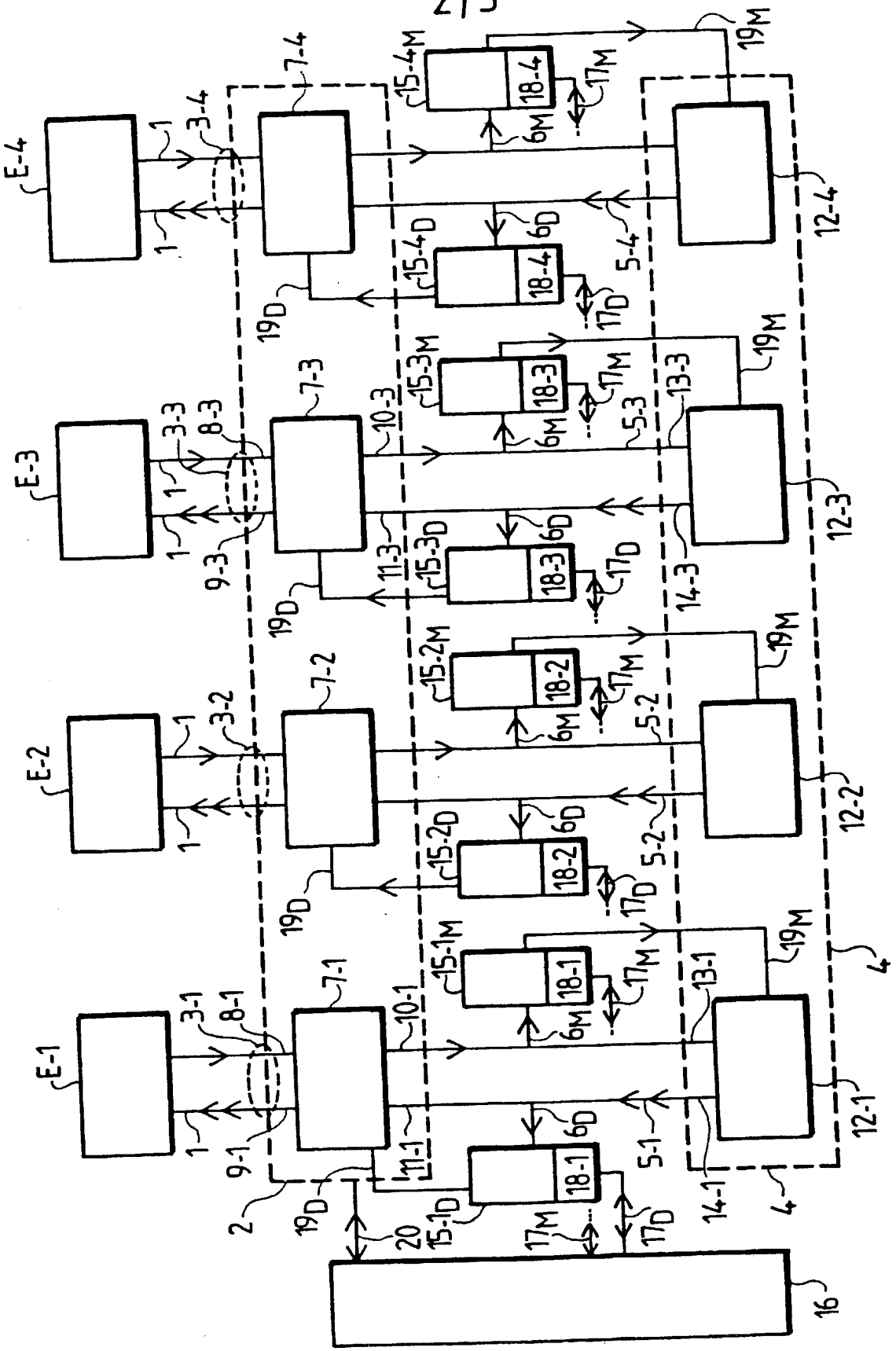


FIG.5

2/3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E-3
E-2
E-1
1
3-4
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3-2
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8-3
8-1
9-3
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7-4
7-3
7-2
7-1
10-3
10-1
11-3
11-1
15-4M
15-4D
15-3M
15-3D
15-2M
15-2D
15-1M
15-1D
18-4
18-3
18-2
18-1
6M
6D
17M
17D
19M
19D
5-4
5-3
5-2
5-1
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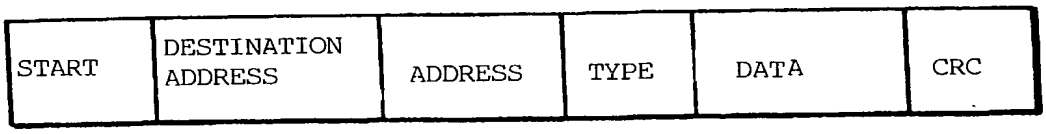
12-1
2
4
20
16

FIG. 2

3/3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DESTINATION ADDRESS
ADDRESS
TYPE
DATA
CRC

FIG.3

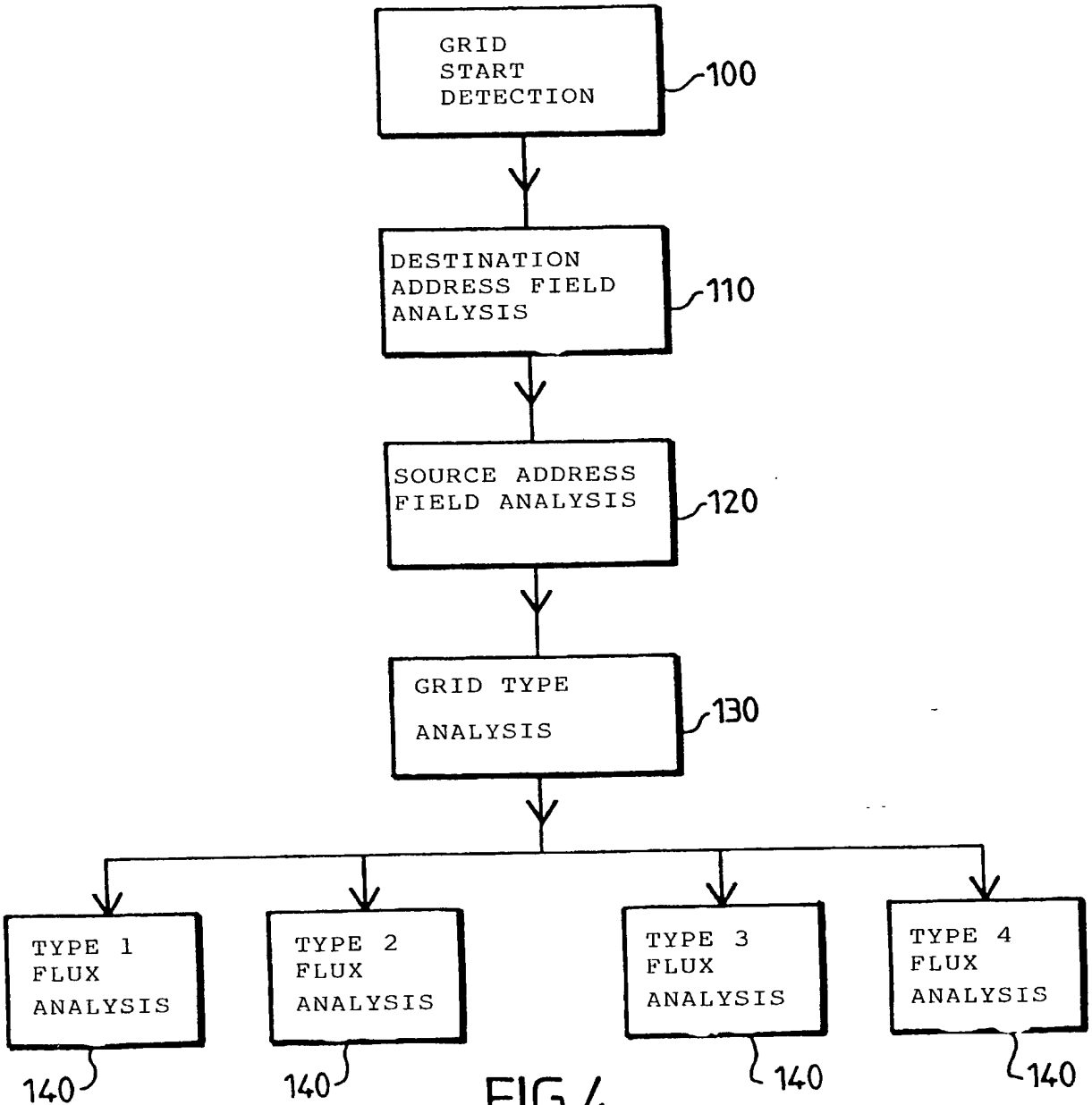
GRID START DETECTION
100
DESTINATION ADDRESS FIELD ANALYSIS
110
SOURCE ADDRESS FIELD ANALYSIS
120
GRID TYPE ANALYSIS
130
TYPE 1 FLUX ANALYSIS
TYPE 2 FLUX ANALYSIS
TYPE 3 FLUX ANALYSIS
TYPE 4 FLUX ANALYSIS
140
140
140
140

FIG.4

219872US2XPCT

Declaration and Power of Attorney for Patent Application
Déclaration et Pouvoirs pour Demande de Brevet

French Language Declaration

En tant l'inventeur nommé ci-après, je déclare par le présent acte que:

Mon domicile, mon adresse postale et ma nationalité sont ceux figurant ci-dessous à côté de mon nom.

Je crois être le premier inventeur original et unique (si un seul nom est mentionné ci-dessous), ou l'un des premiers co-inventeurs originaux (si plusieurs noms sont mentionnés ci-dessous) de l'objet revendiqué, pour lequel une demande de brevet a été déposée concernant l'invention intitulée

et dont la description est fournie ci-joint à moins

☐ ci-joint

☐ a été déposée le _____

sous le numéro de demande des Etats-Unis ou le numéro de demande international PCT

_____ et modifiée le

_____ (le cas échéant).

Je déclare par le présent acte avoir passé en revue et compris le contenu de la description ci-dessus, revendications comprises, telles que modifiées par toute modification dont il aura été fait référence ci-dessus.

Je reconnais devoir divulguer toute information pertinente à la brevetabilité, comme défini dans le Titre 37, § 1 56 du Code fédéral des réglementations.

As a below named inventor, I hereby declare that:

My residence, mailing address and citizenship are as stated next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled.

DEVICE FOR SECURELY MONITORING DATA SWITCHING

the specification of which

☐ is attached hereto.

☒ was filed on February 25, 2002

as United States Application Number or PCT International Application Number

10/049,647 and was amended on

_____ (if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56.

DOCKET NO.: 219872US2XPCT

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF: Patrice TOILLON, et al.

SERIAL NO.: 10/049,647

FILING DATE: February 25, 2002

FOR: DEVICE FOR SECURELY MONITORING DATA SWITCHING

DECLARATION OF Patrice TOILLON

I, **Patrice TOILLON**, am the first-named inventor of the above-identified application which is the national phase of International PCT Application No. **PCT/FR00/02360**, filed **August 23, 2000.**

It has been brought to my attention that my last name was spelled incorrectly in the International application due to an error in translation. Specifically, my first name was spelled **"Patrice TOILON."** My true and correct name is **Patrice TOILLON**, which has been set forth on the Declaration, Power of Attorney and Petition filed herewith.

I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

X Signature: _____ X Date: Sept, 10th. 2002

Patrice TOILLON
48, rue Schnapper
F-78100 Saint Germain en Laye, France

French Language Declaration

Je revendique par le présent acte avoir la priorité étrangère, en vertu du Titre 35, § 119(a)-(d) ou § 365(b) du Code des Etats-Unis, sur toute demande étrangère de brevet ou certificat d'inventeur ou, en vertu du Titre 35, § 365(a) du même Code, sur toute demande internationale PCT désignant au moins un pays autre que les Etats-Unis et figurant ci-dessous et, en cochant la case, j'ai aussi indiqué ci-dessous toute demande étrangère de brevet, tout certificat d'inventeur ou toute demande internationale PCT ayant une date de dépôt précédant celle de la demande à propos de laquelle une priorité est revendiquée.

I hereby claim foreign priority under Title 35, United States Code, § 119 (a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)
Demande(s) de brevet antérieure(s) dans un autre pays.

(Number) (Numéro)	(Country) (Pays)	(Day/Month/Year Filed) (Jour/Mois/Anné de dépôt)	Priority Claimed Droit de priorité Revendiqué Yes Oui	No Non
99/10698	France	23 August 1999	☒	☐
			☐	☐

Je revendique par le présent acte tout bénéfice, en vertu du Titre 35, § 119(e) du Code des Etats-Unis, de toute demande de brevet provisoire effectuée aux Etats-Unis et figurant ci-dessous.

I hereby claim the benefit under Title 35, United States Code, §119(e) of any United States provisional application(s) listed below.

(Application No.) (N° de demande)	(Filing Date) (Date de dépôt)

Je revendique par le présent acte tout bénéfice, en vertu du Titre 35, § 120 du Code des Etats-Unis, de toute demande de brevet effectuée aux Etats-Unis, ou en vertu du Titre 35, § 365(c) du même Code, de toute demande internationale PCT désignant les Etats-Unis et figurant ci-dessous et, dans la mesure où l'objet de chacune des revendications de cette demande de brevet n'est pas divulgué dans la demande antérieure américaine ou internationale PCT, en vertu des dispositions du premier paragraphe du Titre 35, § 112 du Code des Etats-Unis, je reconnais devoir divulguer toute information pertinente à la brevetabilité, comme défini dans le Titre 37, § 1.56 du Code fédéral des réglementations, dont j'ai pu disposer entre la date de dépôt de la demande antérieure et la date de dépôt de la demande nationale ou internationale PCT de la présente demande:

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s), or § 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1 56 which became available between the filing date of the prior application and the national or PCT International filing date of this application.

(Application No.) (N° de demande)	(Filing Date) (Date de dépôt)	(Status: Patented, Pending, Abandoned) (Statut : breveté, en cours d'examen, abandonné)
PCT/FR00/02360	23 August 2000	

Je déclare par le présent acte que toute déclaration ci-incluse est, à ma connaissance, véridique et que toute déclaration formulée à partir de renseignements ou de suppositions est tenue pour véridique; et de plus, que toutes ces déclarations ont été formulées en sachant que toute fausse déclaration volontaire ou son équivalent est passible d'une amende ou d' une incarcération, ou des deux, en vertu de la § 1001 du Titre 18 du Code des Etats-Unis, et que de telles déclarations volontairement fausses risquent de compromettre la validité de la demande de brevet ou du brevet délivré à partir de celle-ci.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

French Language Declaration

POUVOIRS: En tant que l'inventeur cité, je désigne par la présente l'(les) avocat(s) suivant(s) pour qu'ils poursuive(nt) la procédure de cette demande de brevet et traite(nt) toute affaire s'y rapportant avec l'Office des brevets et des marquees: *(mentionner le nom et le numéro d'enregistrement).*

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith (list name and registration number)

022850

Addresser toute correspondance à:

Send Correspondence to:

022850

Adresser tout appel téléphonique à:
(nom et numéro de téléphone)

Direct Telephone calls to: (name and telephone number)

(703) 413-3000

Nom complete de l'unique ou premier inventeur	Full name of sole or first inventor Patrice TOILLON
Signature de l'inventeur Date 1/10	✓ Inventor's signature ✓ Date Patrice Toillon 23RD April 2002
Domicile	Residence 48, rue Schnapper F-78100 Saint Germain en Laye, FRANCE FRV
Nationalité	Citizenship France
Adresse Postale	Mailing Address Same as above

Nom complete du second co-inventeur, le cas echean 2/10	Full name of second joint inventor, If any Eric TIRIOU
Signature de l'inventeur Datum	✓ Second inventor's signature ✓ Date Eric Tiriou 17TH April 2002
Domicile	Residence 34, rue Victor Hugo, F-78114 Magny les Hameaux, FRANCE FRX
Nationalité	Citizenship France
Adresse Postale	Mailing Address Same as above

(Fournir les mêmes renseignements et la signature du troisième co-inventeur et de tout co-inventeur supplémentaire.)

(Supply similar information and signature for third and subsequent joint inventors.)

French Language Declaration

Nom complet du troisième co-inventeur, le cas echeant	Full name of third joint inventor, If any Marc PEYTHIEUX
Signature de l'inventeur Date	Third inventor's signature Date Marc Peythieux 25th april 2002
Domicile	Residence 9, Residence des Quinconces F-91190 Gif sur Yvette, FRANCE
Nationalité	Citizenship France FRX
Adresse Postale	Mailing Address Same as above

Nom complet du quatrième co-inventeur, le cas echeant	Full name of fourth joint inventor, If any
Signature de l'inventeur Date	Fourth inventor's signature Date
Domicile	Residence
Nationalité	Citizenship
Adresse Postale	Mailing Address

Nom complet du cinquième co-inventeur, le cas echeant	Full name of fifth joint inventor, If any
Signature de l'inventeur Date	Fifth inventor's signature Date
Domicile	Residence
Nationalité	Citizenship
Adresse Postale	Mailing Address

Nom complet du sixième co-inventeur, le cas echeant	Full name of sixth joint inventor, If any
Signature de l'inventeur Date	Sixth inventor's signature Date
Domicile	Residence
Nationalité	Citizenship
Adresse Postale	Mailing Address

(Fournir les mêmes renseignements et la signature du septième co-inventeur et de tout co-inventeur supplémentaire.)

(Supply similar information and signature for seventh and subsequent joint inventors.)